

Course code	Course name	L-T-P-Credits	Year of Introduction
AE410	POWER PLANT INSTRUMENTATION	3-0-0-3	2016
<b>Prerequisite : Nil</b>			
<b>Course Objective</b>			
<ul style="list-style-type: none"> <li>To introduce the basics of Power generation</li> <li>To enable the design of power plant control using various methods</li> </ul>			
<b>Syllabus</b>			
Survey of methods of power generation-Boiler -P & I diagram of boiler -Measurement in boiler and turbine-Measurements in power plants -Controls in boiler-Nuclear power plant instrumentation.			
<b>Expected outcome</b>			
At the end of the semester students will be			
<ol style="list-style-type: none"> <li>Familiar with the basics of Power plant and power generation.</li> <li>Familiar with the design of Analysers and control loops used in power plant.</li> </ol>			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>Gill A.B, “<i>Power Plant Performance</i>”, Butterworth, London, 1984.</li> <li>P.C Martin, I.W Hannah, “<i>Modern Power Station Practice</i>”, British Electricity International Vol. 1 &amp; VI, Pergamon Press, London, 1992.</li> <li>Sam. G.Dukelow, “<i>The Control of Boilers</i>”, 2nd Edition, ISA Press, New York, 1991</li> </ol>			
<b>Reference Books</b>			
<ol style="list-style-type: none"> <li>David Lindsley, “<i>Boiler Control Systems</i>”, McGraw Hill, New York, 1991.</li> <li>Jervis M.J, “<i>Power Station Instrumentation</i>”, Butterworth Heinemann, Oxford, 1993.</li> <li>Modern Power Station Practice, Vol.6, “<i>Instrumentation, Controls and Testing</i>”, Pergamon Press, Oxford, 1971.</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	Semester Exam Marks
<b>I</b>	Brief survey of methods of power generation-hydro, thermal, nuclear, solar and wind power Introduction to thermal power plant processes – building blocks - ideal steam cycles	6	15%
<b>II</b>	Boiler – types, Boiler - turbine units and its range systems, feed water systems, steam circuits, air preheating. Soot blowers, combustion process, products of combustion, fuel systems, treatment of flue gases, smoke density measurements, steam turbine, condensate systems, alternator, feed water conditioning, turbine bypass valves. Importance of instrumentation in power generation – details of boiler processes, combined cycle power plant, power generation and distribution, burner tilting, and bypass damper.	7	15%
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	Measurement in boiler and turbine: Metal temperature measurement in boilers, piping	7	15%

	System for pressure measuring devices, smoke and dust monitor, flame monitoring. Introduction to turbine supervising system, pedestal vibration, shaft vibration, eccentricity measurement. Installation of non-contracting transducers for speed measurement.		
<b>IV</b>	Measurements in power plants: Electrical measurements – current, voltage, power, frequency, power factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor.	7	15%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	Controls in boiler: Boiler drum level measurement methods, feed water control, soot blowing operation, steam temperature control, Coordinated control, boiler following mode operation, turbine following mode operation, selection between boiler and turbine following modes. Distributed control system in power plants interlocks in boiler operation. Cooling system, Automatic turbine runs up systems.	8	20%
<b>VI</b>	Nuclear power plant instrumentation: Piping and instrumentation diagram of different types of nuclear power plant, Nuclear reactor control loops, reactor dynamics, pulse channel and logarithmic instrumentation, control and safety instrumentation, reliability aspects.	7	20%
<b>END SEMESTER EXAMINATION</b>			

**QUESTION PAPER PATTERN:**

Maximum Marks:100

Exam Duration: 3 Hours

**Part A**

Answer any two out of three questions uniformly covering Modules 1 and 2 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

**Part B**

Answer any two out of three questions uniformly covering Modules 3 and 4 together. Each question carries 15 marks and may have not more than four sub divisions.

(15 x 2 = 30 marks)

**Part C**

Answer any two out of three questions uniformly covering Modules 5 and 6 together. Each question carries 15 marks and may have not more than four sub divisions.

(20 x 2 = 40 marks)